

Corporate Entrepreneurship and Risk in the Renewable Energy Field

Alexandra Chinie

Roxana Clodnitchi

The Academy of Economic Studies

Bucharest, Romania

This work was cofinanced from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/142115 „Performance and excellence in doctoral and postdoctoral research in Romanian economics science domain”

Abstract

The challenge to meet the world's energy needs with energy from renewable sources needs to be accompanied by efforts to understand what drives the development of the renewable energy field, and which factors may hinder its growth. While uncertainty regarding renewable energy regulations is considered a risk to the further development of the renewable energy business, energy providers also face lower demand and lower market prices. Assessing the strategic position towards risk in energy companies and diversifying companies with no energy background may contribute to the understanding of the transition phenomena from conventional energy to renewable energy, a process which is sustained by entrepreneurial companies. The present paper aims at reviewing the main risks of renewable energy businesses and studying the risk-taking characteristics of companies that have invested in the field following a corporate entrepreneurship strategy. The research relies on the current body of literature and on a multiple case study of 30 companies. The results outline how the company's perception towards risk may influence the risk-taking entrepreneurship characteristic, as well as the fact that newer, improved technologies may depend on smaller companies rather than energy corporations.

1. Introduction

The development of the renewable energy business has strongly relied on governmental policies aiming at fostering investments and minimizing the risks of the business owners. According to Wüstenhagen and Menichetti, policies that reduce the perceived risk of investors are more likely to result in large-scale deployment of renewable energy (Wüstenhagen & Menichetti, 2012). However, incentive policies have changed drastically starting with 2012, with the governments of countries such as Spain, the Czech Republic, Greece and Bulgaria announcing retroactive cuts of their previous financial support. In this context, uncertainty regarding the long-term orientation of governmental policies became a risk to renewable energy investors. The strategic choice of investing in renewable energy is based on a function of risk and return (Wüstenhagen & Menichetti, 2012), and uncertainty and high price volatility may lead to the investment being postponed until higher prices than the net present value break-even price are available (Fleten et al., 2007).

The investor's perspective regarding risks becomes important in order to tackle ways that would lead to the further growth of the industry. Nanda et al. (2013) stated that in 2009, the top 20% firms accounted for over 40% of renewable energy patents, data collected from the US Patent and Trademark Office. This fact substantiates the need to define the characteristics of entrepreneurial companies in the renewable energy field.

From a portfolio perspective, diversifying the domain of activity of incumbents or companies without an energy background can reduce risks. Bhattacharya and Kojima have shown that an increase of investments in renewable energy can lower the risks of the energy supply portfolio. This is achieved by minimizing capital and operating costs, as well as mitigating volatility of fossil fuel prices (Bhattacharya & Kojima, 2012). Diversification can mean creating or acquiring a new venture, or opening a new business unit for renewable energy generation. In this context, studying corporate entrepreneurship in the renewable energy field may provide useful information both for policy makers and investors.

As the company's position against risk is one of the main dimensions of corporate entrepreneurship, along with innovation and proactiveness, analyzing the risk characteristics of renewable energy investors would bring more insight into the behavioral aspects of companies from the renewable energy market.

In this sense, the present study relies on a multiple case analysis where the risk characteristics of 30 companies that have invested in renewable energy following a corporate entrepreneurship strategy are examined. The results may provide information for policy makers and renewable energy clusters aiming at mitigating risks in the field.

2. Conceptual Framework

2.1. Risk as a Corporate Entrepreneurial Characteristic

While there are many forms which corporate entrepreneurship takes in the academic literature, there are two main concepts that describe the phenomena: corporate venturing, which relies on innovation, and renewal activities that enhance a corporations' ability to compete and take risks (Phan et al., 2009), conceptualized as strategic renewal by Dess et. al. (1999), and strategic entrepreneurship by Morris et al. (2010).

Lumpkin and Dess (2001) identified four variables that can be controlled by the organization: innovation, proactiveness, risk-taking and competitive aggressiveness. Hornsby (2002) and Kuratko (1990) have both researched five factors that support corporate entrepreneurship: management support, rewards/reinforcements, time availability, work discretion (autonomy) and organizational boundaries. Antoncic and Hisrich (2001) mentioned innovativeness, proactiveness, autonomy, competitive aggressiveness and risk-taking.

Table 1 summarizes the variables that describe corporate entrepreneurship and the control factors that influence these variables.

Table 1: Corporate Entrepreneurship Variables and Control Factors

| Contributions | Corporate entrepreneurship variables | Control |
|---------------------------------|--|---|
| Lumpkin and Dess, 1996 | <ul style="list-style-type: none"> - Innovation - Proactiveness - Risk taking - Competitive aggressiveness | <ul style="list-style-type: none"> - Organizational climate (Covin & Slevin, 1991) - Resource availability (Kuratko, 1990) - Managerial support and control |
| Hornsby, 2002 and Kuratko, 1990 | <ul style="list-style-type: none"> - Management support - Rewards/reinforcements - Time availability - Work discretion (autonomy) - Organizational boundaries | <ul style="list-style-type: none"> - Motivation (Parker, 2000) - Organizational climate (Covin & Slevin, 1991) - Support system of knowledge, skills and abilities (Unsworth & Parker, 2003) - Leadership |
| Antoncic and Hisrich, 2001 | <ul style="list-style-type: none"> - Innovativeness - Autonomy - Competitive aggressiveness - Risk-taking - Proactiveness | <ul style="list-style-type: none"> - Organizational climate (Covin & Slevin, 1991) - Resource availability (Kuratko, 1990) - Managerial support and control - Strategy implementation |

The concepts that are repeatedly stated in the aforementioned studies are innovation, proactiveness and risk-taking. Risk-taking is the degree to which managers are willing to make large and risky resource commitments, for instance, those which have a reasonable chance of costly failure (Miller & Friesen, 1982).

2.2. Risk-Taking in the Renewable Energy Field

As investments in renewable energy are growing significantly, also uncertainties regarding funding of projects are expanding at a higher rate. Risk in relation to investment in renewable energy projects can be described by the negative impact which uncertain future events may have on the financial value of a project or investment (Cleijne & Ruijgrok, 2004). Wüstenhagen and Menichetti (2012) consider that renewable energy investments can be conceptualized as a function of risk, return and policy: when investing in this kind of projects, entrepreneurs evaluate the balance between potential risks and possible returns of investments, and then they choose the best

return for a given level of risk. Incumbent firms have a much greater opportunity cost when pursuing new opportunity (York & Venkataraman, 2010), by losing focus on the main business.

In recent years, papers like “Green light for renewable energy investments” (Rodenhuis, 2008), “Managing the risk in renewable energy” (The Economist Intelligence Unit, 2011), “Renewable Energy Financing and Climate Policy Effectiveness” (Pierpont et al., 2011) have drawn conclusions related to the risks in the renewable energy field. The Economist Intelligence Unit (2011) underlined ways of mitigating risks such as diversification and insurance policies, which transfers risks to third parties.

Scientific literature presents several risk-related analysis instruments available to be used by companies within the renewable energy sector (Swiss Re, 2011). The Risk Breakdown Structure (RBS) is a useful instrument for stakeholders when they wish to classify or prioritize the most essential risks that they need to mitigate in order to make profitable investments. Risks can be split into extrinsic – jurisdictional characteristics that would have specific relevance to the electricity sector, and intrinsic risks, or technology-specific factors (Oxera Consulting, 2011). Evaluation of energy technologies based solely on the levelised cost of energy may leave out renewable alternatives that can minimize overall generation cost over time. In this sense, portfolio theory concepts can be a valuable instrument when analyzing diversification among conventional and renewable energy, as well as among different types of alternative technologies (Awerbuch & Yang 2007).

Table 2 summarizes the main risks related to renewable energy investments, as previously included in researches performed by Cleijne and Ruijgrok (2004), Oxera Consulting (2011), Michelez et al. (2011), Swiss Re, Bloomberg New Energy Finance (2013), Tantau et al. (2013) and Nichifor et al. (2014).

Table 2: Extrinsic and Intrinsic Risks in the Renewable Energy Field

| | Category of risks | Types of risks |
|--------------------------|---|---|
| Extrinsic | Market | Low energy demand |
| | | Higher feedstock, technology & third party services purchase prices |
| | | Lower market prices |
| | | New entrants |
| | | Curtailment of renewable electricity (Denholm, 2012) |
| | | Access to finance |
| | | Default of counterparty in PPA |
| | Regulatory/ Political | Changes of the renewable energy policies |
| | | Decrease of financial support |
| | | Retroactive support cuts |
| | | Taxation |
| | Weather | Less energy output for wind &/ sun energy |
| | | Higher prices for energy crops |
| Natural disasters | | |
| Public perception | Boycotting of renewable energy projects | |
| Intrinsic | Construction | Loss or damage |
| | | Start-up delays |
| | | Lead times |
| | Operational | Imbalance in delivery to the grid |
| | | Default of counterparty in O&M agreement |
| | | Theft |
| | | Accident |
| | | Third party issues |
| | Technology | Higher maintenance costs |
| | | Lower plant availability and generation efficiency (Cleijne & Ruijgrok, 2004) |
| | | Equipment malfunctions |
| | Capital | Available investment capital of the company |
| | | Solvency requirements |

Regulatory uncertainty and the decrease of governmental financial support are ubiquitous topics in renewable energy researches. A recent research conducted by the authors provides more insight into this topic (Clodnitchi & Chinie, 2015).

When analyzing market conditions further, another possible risk for renewable energy producers is the dropping demand for renewable energy. This risk however is quite low, as the demand is expected to rise, but at the same time competition may increase strongly as well, as the Green-X study, conducted by Cleijne and Ruijgrok (2004), puts it. For generators trading in green electricity, the price development of electricity - determined by supply and demand of electricity on the one hand and by fossil fuel prices on the other – constitutes a risk source which directly affects prices (Cleijne & Ruijgrok, 2004).

Society isn't always supportive of renewable energy projects. Many protests against renewable energy projects were motivated by their negative impact on wildlife, while others were motivated by its effects on the quality of life as is the case of noise coming from wind parks (Lefebvre, 2013). Raising public awareness and support would reduce the risk of overcoming social barriers when investing in a renewable energy project.

From an intrinsic point of view, high risks may be involved in the development and construction of renewable energy plants. According to the Green-X research, for the most types of contracts the developer's risks have been covered either by turnkey contracts or strong Engineering, Procurement and Construction Contracts, where the included schedule and performance specifications involve monetary compensation for failure to meet deadlines or the predetermined performance levels. (Cleijne & Ruijgrok, 2004).

From a technology point of view, the risks that have to be controlled are related to the technological performance and equipment degradation, financial strength of the manufacturer and technological change. Operating risks such as low plant performance, maintenance risks and risks related to operating costs can be reduced or prevented by the know-how of the plant, all-risk-insurance and by the ability to forward costs. Moreover, there are mitigation instruments for construction risks, such as Engineering Procurement and Construction Agreements, completion guarantees for delays, monitoring reports, exclusive land lease agreements and cost contingency funds (Deutsche Bank, 2012).

Insufficient access to capital was the highest ranked risk identified in the two studies conducted by Tantau and Nichifor (Tantau et al., 2013, Nichifor et al., 2014). Pirlogea finds that although operating costs are lower, initial investment costs for renewable energy plants are high, which may mean that a plant that produces energy from renewable sources has a lower capacity per monetary unit invested than conventional energy plants (Pirlogea, 2011). In order to be able to attract supplementary venture capital or bank funding, renewable energy companies have to be financially solvent. Solvency is however not enough. Insufficient access to finance can be generated by an unfavorable economic climate towards renewable energy investments (extrinsic risk).

Authors identified several measures for reducing the above described risks: long-term fuel supply agreements, diversification, report on the energy yield/wind/solar studies for wind/sun intermittency prevention, implementing alarm systems, or etching individual ID codes on components so they are readily identifiable if stolen; replacement; long-term off-take agreement, regulatory framework; hedging, financial covenants, market flex; technology and testing, environmental audit, insurance (Deutsche Bank, 2012; Groobey et al., 2010; Appleyard, 2013).

3. The research method

3.1 Research Design

The analysis is based on qualitative data gathered from 30 companies that have diversified their domain of activity by investing in renewable energy. The data collection phase took place between January 2013 and February 2014, and consisted of creating a database with companies that have invested in renewable energy following a corporate entrepreneurship initiative and sending out structured interviews to managers involved in the renewable energy business of the company. Companies were selected from online databases and from the Romanian Transmission System Operator, and included both energy companies and companies with no background in the energy field. We made telephonic follow-ups for companies that activated in Romania and haven't answered our email. During an energy fair, we personally interviewed another 4 companies. Nineteen of the companies that participated to the study are international players that are active in Europe, the Middle East and Africa.

We performed a qualitative analysis on the collected data, based on the ratings of risk-taking characteristic items of Covin and Slevin (1989).

The multiple case studies approach (Eisenhardt & Graebner, 2007) was used in order to compare risk-taking as corporate entrepreneurship characteristic in energy and non-energy companies, as well as small sized, medium companies and corporations that have invested in renewable energy.

3.2 The Research Instrument

The first set of questions included in the survey referred to the primary domain of activity of the respective company, the renewable energy field in which they are active and the size of the company. Questions regarding the main field of activity and the renewable energy field were multiple choice. Interviewees were further asked to select among the main types of renewable energy: solar energy, hydropower, wind power, biomass, bio fuel, geothermal (renewablesguide.co.uk, 2014), and enabling technologies. One of the reasons for these main categories to be included in the questionnaire was their importance in achieving the European Union's 2020 target plan for renewable energy (Beurskens et al., ECN, 2011), and their technological maturity among renewable energy sources. However, respondents were able to fill in a different renewable energy, if their product didn't fit any of the predefined categories. Different types of renewable energy filled in by respondents were landfill gas, energy from heat recovery and from other waste materials.

In order to identify behavioral patterns, we split the interviewed companies according to their prior field of activity, their size, and according to the implemented renewable technology.

Risk-taking was analyzed through a set of 3 questions, based on Covin and Slevin (1989): "High-risk projects with chances of very high returns" (RT1), "A bold, aggressive posture in order to maximize the probability of exploiting potential when faced with uncertainty" (RT2), "Owing to the nature of the environment, bold, wide ranging acts are necessary to achieve the firm's objectives" (RT3). Respondents were asked to rate how the three items fit to the description of their organizations, based on a 7-points Likert scale: 1 if they completely disagreed with the description and 7 if they fully agreed that the item describes the characteristics of their company well.

Considering that the attitude towards risk may be influenced by the perception regarding the business environment, a question referring to the hostility of the business environment was included in the study. Respondents were asked to what extent they agreed that their business environment (depending on chosen technology, market etc.) was described by very high competition, rising business costs, unreliable supplier quality or shortage of labor. Answers were rated on a 7-points Likert scale.

The most predominant primary domains of activity of the surveyed companies were energy (15 companies) and technology (5 companies). Consultancy services and retail were each selected by 2 companies, while consumer goods and services were selected by 3 respondents. Other domains filled out by respondents were waste management (2 companies), construction, engineering, industrial goods, transportation and heat recovery.

Among the interviewed companies, most investments in renewable energy were done in solar energy (13 respondents). Wind power, hydropower and biomass are all represented by 8 of the respondents each. The renewable energy fields in which the interviewed companies have least invested are enabling technologies (4 companies) and geothermal energy (3 companies).

The largest share of companies that invested in renewable energy following a corporate entrepreneurship strategy are small or middle sized: 19 of the respondents are companies with 1 to 50 employees (small companies), 7 are companies with 50 to 500 employees (medium-large), while 4 companies have more than 500 employees (big corporations).

4. Results and Discussion

The first two risk-taking items had a median rating of 4, while the third, "owing to the nature of the environment, bold, wide ranging acts are necessary to achieve the firm's objectives" had a median rating of 5.

The lowest median rating for the three risk-taking items was given by a big company (more than 500 employees) from the energy sector (providers of heat), who rated all risk-taking items with 1.

Table 3: Median and Average Ratings of the three Risk-Taking Items

| Category | Median ratings | | | Average ratings | | |
|-----------------------|----------------|-----|-----|-----------------|------|------|
| | RT1 | RT2 | RT3 | RT1 | RT2 | RT3 |
| Non-energy | 4 | 4.5 | 5 | 4.15 | 4.50 | 4.93 |
| Energy | 4 | 4 | 5.5 | 3.69 | 3.93 | 4.86 |
| Small | 3.5 | 4 | 5 | 3.69 | 3.94 | 4.79 |
| Medium-large | 5 | 5 | 6 | 5.00 | 5.14 | 5.83 |
| Corporation | 3 | 4 | 4.5 | 3.00 | 3.75 | 4.00 |
| Wind power | 3 | 4.5 | 6 | 2.71 | 4.00 | 5.13 |
| Hydropower | 3 | 5 | 6 | 3.50 | 4.13 | 5.00 |
| Solar power | 3 | 4 | 6 | 3.42 | 4.25 | 5.31 |
| Biomass | 3 | 5 | 6 | 3.57 | 4.71 | 5.13 |
| Bio fuel | 5 | 5 | 4 | 4.33 | 4.67 | 4.67 |
| Geothermal | 2 | 4 | 6 | 2.67 | 4.00 | 5.67 |
| Enabling technologies | 5 | 4 | 5 | 4.75 | 3.75 | 5.00 |

The highest rating (7 for all the three risk-taking items) was given by a medium-large company with transportation services as primary domain of activity, active on a local market.

“High-risk projects with chances of very high returns” received the lowest ratings (1-2) from four energy companies and three diversifying companies with no energy background. The three companies that rated RT1 with 1 have invested in wind power and hydropower. A recent comparative study conducted by Nichifor et al (2014) found that wind energy investors rated several risk categories, such as market, technological, weather and financial risks lower than solar energy investors did. Due to the closeness of wind energy to reach grid parity in Europe (Roland Berger, 2011), to the fact that wind energy generation cost already lays below conventional sources in some parts of the world (Cardwell, 2014), and the relatively low level of support granted today, the wind energy business is considered to be less likely to generate high returns but it is also considered less risky. The highest ratings (6-7) for risky projects with chances of high return were given mostly by diversifying companies with no energy background (4 out of 6). Five out of the six companies that engage in projects with high risks are internationally active, with investments in hydropower, biomass and renewable energy enabling technology.

The lowest ratings for the second risk-taking characteristic were given mostly by energy companies (4 out of 6), with most investments in hydropower (3 companies). Other renewable energy technologies used by these respondents were solar and wind technologies. Most companies that rated RT2 high (6-7) invested in solar energy (3 out of 6), hydropower and biomass.

The third risk-taking item, “bold, wide ranging acts necessary to achieve the firm’s objectives” is the highest rated corporate entrepreneurship characteristic among the thirty participants to the study. While the first two risk-taking items each received 6 and 7 ratings from 6 companies, RT3 received high ratings from 14 companies (almost half of the studied sample). The distribution of these 14 companies into energy and non-energy companies is equal. Wind power and biomass were equally represented by 5 companies that rated RT3 high, while 4 of them invested in hydropower. Although 7 companies invested in solar energy, taking into account the higher number of solar power investors among the thirty companies included in the study, in comparison to wind, hydropower and biomass technologies, we can conclude that companies with high ratings of RT3 preferred the latter renewable sources for investments.

In order to analyze how the business branch of the company investing in renewable energy and their characteristic might influence their position towards risk, the median rating for each of the risk-taking items was attributed to each category of the interviewed companies (Table 3).

While there is no significant difference between the overall ratings of energy and non-energy companies, their size and the preferred renewable energy technology they invested in might depend on their risk-taking characteristics.

Corporations (with over 500 employees) have the lowest rating of the risk-taking items, with the lowest being attributed to projects which carry high risk and with high chances of return. While small companies have rated risk-taking items lower than medium-large companies have, their responses showed more engagement in projects with perceived high risk than in the case of corporations.

Respective of the company's strategy regarding investments in projects which carry high risk, participants to the case study have decided to invest in a specific renewable energy technology. According to the median ratings of the risk-taking items in the survey, companies which are least characterized by high-risk investments have mostly capitalized on geothermal technology. Respondents which positioned themselves as investors in high-risk projects (with a rating of at least 5 for RT1 on the 7-points Likert scale) have invested in bio fuel and enabling technologies, which may be correlated to higher investment capital, and too little reward when investing in new technology.

The third risk-taking item was the highest rated, with no significant difference between the ratings of the studied categories, except for size. According to the median ratings, "bold, wide ranging acts to achieve the company's objectives" might be mostly attributed to medium-large energy companies. This characteristic also relies on the company's perception regarding their business environment.

Participants to the study did not consider their business environment to be very hostile. Answers regarding the business environment of the company averaged around 4.6 on the 7-point Likert scale, with a median rating of 5, where 1 was attributed to full disagreement that the environment is hostile, and 7 was attributed to full agreement. While respondents that considered their business environment to be very hostile did not engage in riskier projects much less than those companies that considered their business environment to be adequate, they disagreed having a bold, aggressive posture, more than the others (Table 4).

Table 4: Average Ratings of the Risk-Taking Items Depending on the Business Environment Perception

| Ratings of the business environment (1 – not hostile at all; 7 – very hostile) | RT1 | RT2 | RT3 |
|--|------|------|------|
| 6-7 | 3.73 | 3.55 | 5.20 |
| 4-5 | 4.00 | 4.40 | 4.73 |
| 2-3 | 4.17 | 5.00 | 4.75 |

In the case of the third risk-taking characteristic, companies that considered their business environment to be hostile also considered that bold actions are needed in order to adapt, more than companies with a moderate perception of their environment did (Table 4).

5. Conclusions

The risk-taking characteristics of companies engaged in the renewable field depend rather on the company's size and the chosen renewable technology than on their experience in the energy field - there is no significant difference between the overall ratings of energy and non-energy companies.

Companies investing in renewable energy tend to prefer mature technologies that have achieved or are soon to achieve grid parity. The lowest rating of the risk-taking items were given by big corporations. Investments in projects with high risks but with chances of high returns mostly rely on medium-large companies. In this context, developing and improving newer technologies may depend more on medium-sized companies than corporations.

The findings of the study outlined the fact that the way management perceives risks of the business environment are correlated to the company's investment strategy: "bold, wide ranging acts are necessary to achieve the firm's objectives", depending on the nature of the environment. Further research should aim at analyzing the variables that influence and may change risk-taking characteristics in energy incumbents and diversifying companies and would contribute significantly to the development of incentives and support systems for the renewable energy business.

References

- Antoncic, B., & Hisrich, R.D. (2001). Intrapreneurship: construct refinement and cross-cultural validation. *Journal of Business Venturing*, 16(5): 495-527
- Appleyard, D. (2013). Mitigating renewable energy risk. published November 25th, 2013, available online at www.renewableenergyworld.com/rea/news/article/2013/11/mitigating-renewable-energy-risk.
- Awerbuch, S., & Yang, S. (2007). Efficient electricity generating portfolios in Europe: Maximising energy security and climate change mitigation. *EIB Papers*, 12(2), 8-37.
- Bhattacharya, A., & Kojima, S. (2012). Power sector investment risk and renewable energy: A Japanese case study using portfolio risk optimization method. *Energy Policy*, 40(1), 69-80.
- Beurskens L. W. M., Hekkenberg M., & Vetham P., Energy Research Centre of the Netherlands (2011). Renewable Energy Projections as Published in the National Renewable Energy Action Plans of the European Member States, Covering all 27 EUR Member States, available at <https://www.ecn.nl/docs/library/report/2010/e10069.pdf>.
- Cardwell D. (2014). Solar and Wind Energy Start to Win on Price vs. Conventional Fuels. *New York Times* 23.11.2014, Energy & Environment, available at http://www.nytimes.com/2014/11/24/business/energy-environment/solar-and-wind-energy-start-to-win-on-price-vs-conventional-fuels.html?_r=0.
- Cleijne, H., & Ruijgrok, W. (2004). Deriving Optimal Promotion Strategies for Increasing the Share of RES-E in a Dynamic European Electricity Market: Modelling risks of renewable energy investments. GREEN-X, Work Package 2, available at [http://www.green-x.at/downloads/WP2%20-%20Modelling%20risks%20of%20renewable%20energy%20investments%20\(Green-X\).pdf](http://www.green-x.at/downloads/WP2%20-%20Modelling%20risks%20of%20renewable%20energy%20investments%20(Green-X).pdf).
- Clodnitchi, R. & Chinie, A. (2015). Factors of Impact on the Evolution of Electricity Markets from Renewable Energy Sources: A Comparison between Romania and Germany. *Special Issue on Entrepreneurship in Energy, Management & Marketing*, in press.
- Covin, J. G., & Slevin, D. P. (1989). Strategic Management of Small Firms in Hostile and Benign Environments. *Strategic Management Journal*, 10, 75-87
- Covin, J.G. & Slevin, D.P. (1991). A conceptual model of entrepreneurship as firm behavior. *Entrepreneurship: Theory & Practice*, 16(1), 7-25.
- Dess, G. D., Lumpkin, G. T. & McGee, J. E. (1999). Linking corporate entrepreneurship to strategy, structure and process: suggested research directions. *Entrepreneurship: Theory & Practice*, 23(3): 85-102.
- Denholm, P. (2012). Energy storage to reduce renewable energy curtailment. *Power and Energy Society General Meeting, IEEE*, 1-4, 22-26 July 2012
- Deutsche Bank (2012). Investing in renewable energy – Challenges and opportunities from an international perspective. *Global Climate Partnership Fund, Luxembourg*.
- Eisenhardt K. M., & Graebner M. E. (2007). Building theories from cases: opportunities and challenges. *Academy of Management Review*, 50, 25-32.
- Fleten S. E, Maribu K. M., & Wangensteen I. (2007). Optimal investment strategies in decentralized renewable power generation under uncertainty. *Energy*, 32(5), 803-815.
- Groobey, C., Pierce, J., Faber, M., & Broome, G. (2010). *Project Finance Primer for Renewable Energy and Clean Tech Projects*, Wilson Sonsini Goodrich & Rosati Professional Corporation, available at https://www.wsgr.com/PDFSearch/ctp_guide.pdf.
- Hornsby, J.S., Kuratko, D.F. & Zahra, S.A. (2002). Middle managers' perception of the internal environment for corporate entrepreneurship: assessing a measurement scale, *Journal of Business Venturing*, 17(3): 253-273.
- Kuratko, D.F., Montagno, R.V. & Hornsby, J.S. (1990), Developing an intrapreneurial assessment instrument for effective corporate entrepreneurial environment, *Strategic Management Journal*, 11(special issue): 49-58.
- Lefebvre, F.J. (2013). *Renewable energy myths and obstacles*, Editions MultiMondes
- Lumpkin, G.T. & Dess, G.G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review*, 21(1): 135-172.
- Lumpkin, G.T. & Dess, G.G. (2001). Linking two dimensions of entrepreneurial orientation to firm performance: the moderating role of environment and industry life cycle, *Journal of Business Venturing*, 16(5): 429-451.

- Michelez, J., Blazquez, R. et al. (2011). Risk Quantification and Risk Management in Renewable Energy Projects, IEA – Renewable Energy Technology Deployment, Altran and Arthur D. Little, available at <http://iea-retd.org/wp-content/uploads/2011/11/RISK-IEA-RETD-2011-6.pdf>.
- Miller, D., & Friesen, P.H. (1982). Innovation in Conservative and Entrepreneurial Firms: Two Models of Strategic Momentum, *Strategic Management Journal*, 3, 1-25.
- Morris, M., Kuratko, D. & Covin, J. (2010). *Corporate Entrepreneurship & Innovation*, Cengage Learning.
- Nanda, R., Younge, K. & Fleming, L. (2013). *Innovation and Entrepreneurship in Renewable Energy*, the National Bureau of Economic Research, October 2013.
- Nichifor, M. A., Regneală, H. & Paicu (Coraș). E. L., (2014). Risk mitigation models in renewable energies - solar vs. wind, *Business Excellence Research 2014 Conference Proceedings*, in press.
- Oxera Consulting (2011). Discount rates for low-carbon and renewable generation technologies, Prepared for the Committee on Climate Change, available at www.oxera.com
- Parker, S. K. (2000). From passive to proactive motivation: The importance of flexible role orientations and role breadth self efficacy. *Applied Psychology: An International Review*, 49 (3), 447-469.
- Phan, P.H., Wright, M., Ucbasaran, D. & Tan, W. (2009). Corporate entrepreneurship: Current research and future directions, *Journal of Business Venturing*, 24(3), May 2009.
- Pierpont, B., Varadarajan, U., Nelson, D. & Schopp, A. (2011). Renewable Energy Financing and Climate Policy Effectiveness. CPI Analysis Framework (Working Paper), Climate Policy Initiative, 8 July 2011, available at <http://climatepolicyinitiative.org/wp-content/uploads/2011/12/Renewable-Energy-Financing-and-Climate-Policy-Effectiveness-Working-Paper.pdf>.
- Pirlogea, C. (2011). Barriers to Investment in Energy from Renewable Sources. *Economia. Seria management*, 14, 132-140.
- Rodenhuis, E. J. (2008). Green light for renewable energy investments: A Risk Analysis Tool for Renewable Energy Project Development, University of Twente, Enschede - The Netherlands, July 29, 2007, available at http://essay.utwente.nl/58464/1/scriptie_E_J_Rodenhuis.pdf.
- Roland Berger Strategy Consultants (2011). Studie zum internationalen Windenergiemarkt – Unsichere Wachstumsperspektiven und starker Wettbewerb aus Asien führen zur Konsolidierungswelle, available at http://www.rolandberger.de/pressemitteilungen/511-press_archive2011_sc_content/Studie_zum_internationalen_Windenergiemarkt.html.
- Swiss Re, Bloomberg New Energy Finance (2013). Profiling the risk in solar and wind. A case for new risk management approaches in the renewable energy sector, available online at <http://media.swissre.com/documents/Profiling-the-risks-in-solar-and-wind.pdf>.
- Tantau, A., Coras, E. L., & Regneala, H. (2013) “Risk Dimensions in the Romanian Solar Energy Landscape” *Challenges for the Knowledge Society, Management & Marketing*. - Vol.8, 2013 (special issue).
- The Economist Intelligence Unit (2011). Managing the risk in renewable energy, available at http://www.economistinsights.com/sites/default/files/downloads/EIU-SwissRe_ManagingRiskRenewableEnergy_Web_2.pdf.
- Unsworth, K. L., & Parker, S. K. (2003). Proactivity and Innovation: Promoting a New Workforce for the New Workplace. In: Holman, D., Wall, T. D., Clegg, C. W., Sparrow, P., Howard, A. (Eds.) *The New Workplace: A guide to the Human Impact of Modern Working Practices*, John Wiley & Sons, Chichester, 175-196.
- Wüstenhagen R. & Menichetti, E. (2012). Strategic choices for renewable energy investment: Conceptual framework and opportunities for further research, *Energy Policy*, 40(1), 1-10.
- York, J. G. & Venkataraman, S. (2010). The entrepreneur-environment nexus: Uncertainty, innovation, and allocation. *Journal of Business Venturing*, 25(5), 449-463.
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